2014
SEAFDEC Technical Seminar

22 December 2014

SEAFDEC Training Department

Development and improvement of acoustic equipments and systems for fisheries resources survey in shallow area

Yoshinori Miyamoto, Keiichi Uchida, TUMSAT, Japan
Toyoki Sasakura, FUSION INC, Japan, Yap Minlee, RIHN, Japan
Yuttana Theparoonrat, SEAFDEC/TD, Monton Anongponyoskun, KU, Thailand
Kritsada Thongsila, DOF Thailand

Abstract

The acoustic data collection system including equipment modification were conducted for coastal area survey around set-net fishing ground in Rayong province, Thailand. An analysis methodology is also developed and will be using as a tool for acoustic survey methodology education for young scientist in Thailand. The project modified acoustic device with composed of GPS Plotter Fish-Finder (FURUNO GP1670F), Interface unit and personal computer (PC) for using as acoustic data collection system. The equipment modification was performed by importing the echo-sounder transmitting and receiving signal from transducer cable to newly designed data collection system. The data collection system were composed of Pre-Amplifier and Band Pass Filter, Interface unit, Analog to Digital Converter, and PC computer system. The digital hydro-acoustic data were collected to PC hard disc by using "FishFinder" software program. The GPS position data was transfer from GP1670F to PC Computer pass through standard NMEA to USB port. The GPS position data were recorded to PC by using Windows Hyper-terminal program. The data collection system was design to record the echo-sounder signal of 50 kHz only. The recorded data in ".csv" file format were analyzed by Microsoft Excel Program. The data collection system was calibrated by standard target ball (Tungsten carbine, 38.1 mm) in the acoustic experimental water test tank of TUMSAT, Japan. The experiment survey cruise for investigated on the comparison of abundance of fisheries resources during set-net fishing operation season and off season were conducted during December 2013 and April 2014, respectively. Total survey area covering for 16.25 km^2 of set-net fishing ground with running distant of 38.5 km. The survey results shows a satisfied system performance.

Introduction

This study has been started as part of the RIHN project that is "Coastal area capability enhancement in Southeast Asia". The project aims at investigating the linkage between livelihoods and ecosystem health in the Southeast Asian coastal area are investigated to fully understand its complexity and consequent vulnerability, particularly from the human-related viewpoints through collaborative holistic researches with local peoples. The acoustic data collection system including equipment modification were conducted for coastal area survey around set-net fishing ground in Rayong province, Thailand. An analysis methodology is also developed and will be using as a tool for acoustic survey methodology education for young scientist. Since, depth of the target research area is about 15 meters, a searching range is too narrow for using the scientific echo sounder with available in the market. The project modified acoustic device with composed of GPS Plotter Fish-Finder (FURUNO GP1670F), Interface box and personal computer (PC) for using as acoustic data collection system. The objectives of program are 1) to develop new acoustic data collection system for shallow water, 2) to study on the fisheries resources distribution around set-net fishing ground in Rayong province, Thailand, 3) to estimate the amount of fisheries resources by using acoustic data and fish catch data of set-net fishing operation, and 4) HRD on new acoustic survey equipment and system through on-site training and publication of guideline of acoustic survey for coastal area.

Methodology

Acoustic data collection system including equipment modification were conducted for coastal area survey in Rayong province. The hardware and software system for data collection were developed at Tokyo University of Marine Science and Technology, Tokyo Japan. The first testing of hydro-acoustic equipments and systems for shallow area were conducted at Tateyama Bay, Chiba Prefectures, Japan.

Modification of GPS and echo-sounder system for hydro-acoustic data collection

The hydro-acoustic system for data collection was modified by using FURUNO GPS Plotter model GP-1670F. The GP-1670F was equipped with GPS receiver and chart plotter system. The machine was also equipped with echo-sounder with operated on 50 kHz and 200 kHz simultaneously. The GP-1670F provide a total integrated GPS receiver, color video plotter and color fish finder. The built-in GPS receiver provides highly accurate position, courses and speed information. The fish finder presents vivid underwater images on a high quality LCD.

Figure 1. FURUNO GP-1670F display and control panel

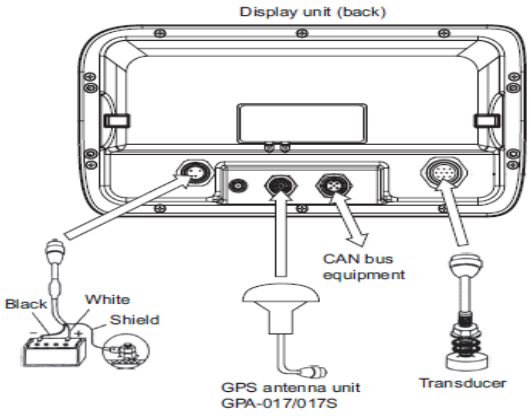


Figure 2. Connection socket of GP 1670F

The equipment modification was performed by importing the echo-sounder transmitting and receiving signal from transducer cable to newly designed data collection system. The data collection system were composed of Pre-Amplifier and Band Pass Filter, Interface unit, Analog to Digital Converter, and PC computer system. The digital hydro-acoustic data were collected to PC hard disc by using “FishFinder” software program. The GPS position data was transfer from GP 1670F to PC Computer pass through NMEA to USB port. The GPS position data were recorded to PC by using Windows Hyper-terminal program. The data collection system was design to record the echo-sounder signal of 50 kHz. only.

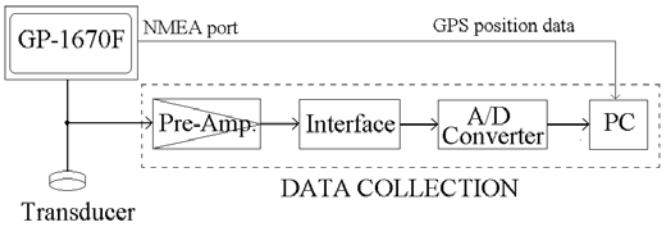


Figure 3. Echo-sounder survey data collection system block diagram

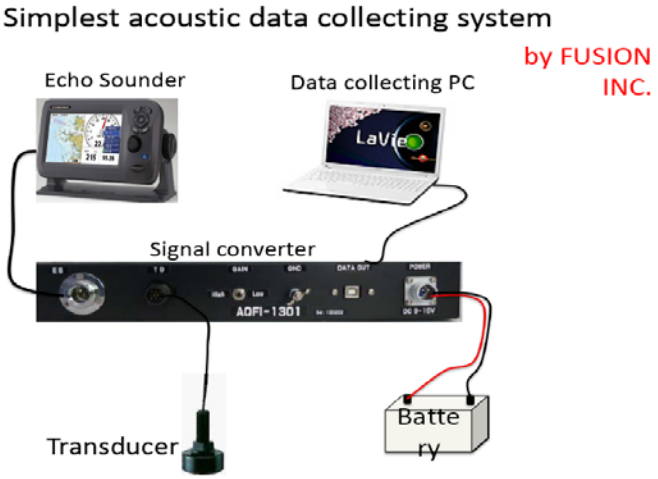


Figure 4. Echo-sounder survey data collection system hardware connection layout

The equipment test were conducted at Tateyama Training Station of TUMSAT in Chiba prefecture during 23-25 October 2012. The survey echo-sounder data collection system was assembly and conduct the sea trial running test on board TUMSAT training boat number 36. A standard target Tungsten Carbine spear ball diameter 38.1 mm. is used for system calibration.

Result of equipment testing

The GPS Plotter GP-1670F operation could be display the boat position, cruising track, speed and direction, and echogram for 50 and 200 kHz. simultaneously. The returned echo signal of 50 kHz imported to hydro-acoustic data collection system was amplify, filled, display and recorded on PC. The echo grams of standard target ball could be clearly detected and record on PC data collector.

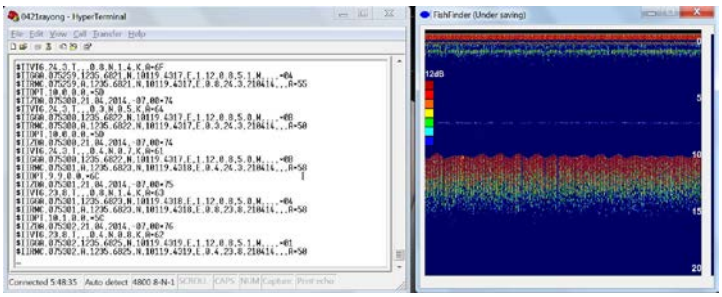


Figure 5. Output of GPS position data (a), and echo gram of standard target ball at 7 m. collected by FishFider Version 3 Program.

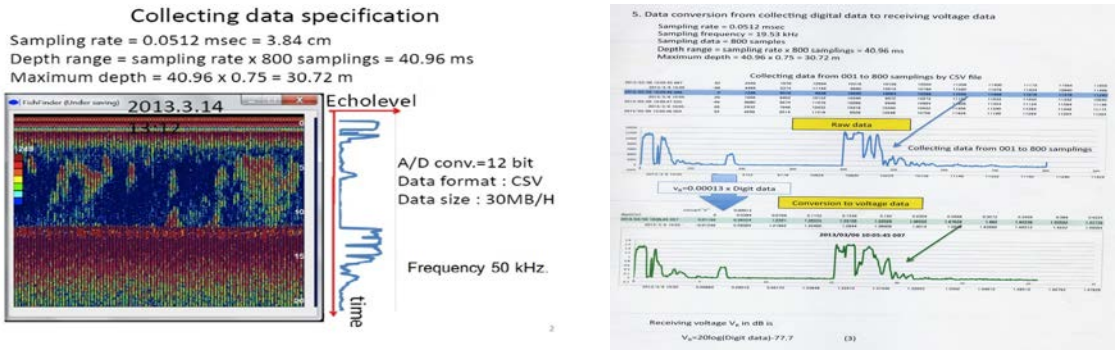


Figure 6. Output data recorded by data collecting PC

In order to investigated on the effect of ship avoidance behavior of fish school during acoustic cruising survey in shallow waters, the tested cruising survey by using small scale fishing boat and auto-pilot kayak boat were conducted in the set net fishing ground at Rayong province. The tested acoustic cruising survey were conducted on board small squid cast-net fishing boat and self auto-pilot kayak boat with running on the same cruising tract in the same day. Program "FishFinder Version 1", for Windows XP was used for echo data recorded. Data of return echo signal from fish school of both survey were compared for the appearance of fish school. The result showed that no effect by ship avoidance behavior of fish school during acoustic cruising survey in shallow waters by small squid cast-net fishing boat and self auto-pilot kayak boat.

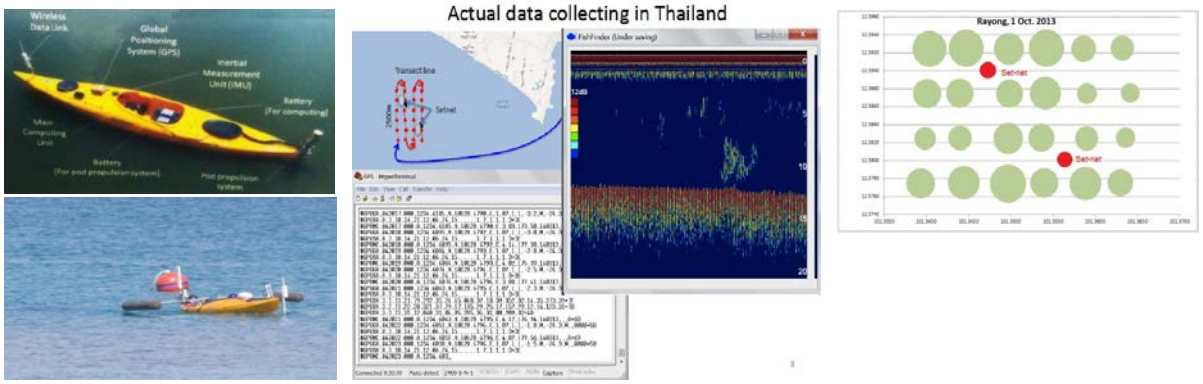


Figure 7. Auto-pilot kayak boat and output data recorded.

The cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The program "FishFinder Version 3" for Windows 7 and new design receiver gain circuit were using for the survey. Total survey area covering for 16.25 km^2 with running distant of 38.5 km. The hydro-acoustic survey was conducted one day ahead of set-net fishing operation performed. The recorded data are under analyzed at Faculty of Fisgeries, Kasetsart University.

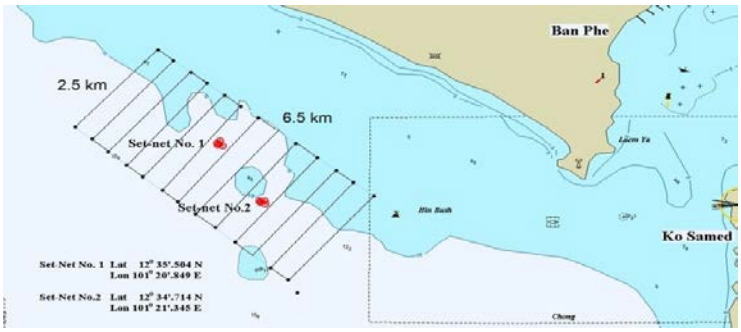


Figure 8. Hydro-acoustic survey cruise tract around set-net fishing ground in Rayong province.

Impacts of the set-net operation on the seawater and bottom sediment conditions in Rayong, Thailand

Sukchai Arnupapboon[1], Penchan la-ongmanee[2], Suwannee Chernbamrung[3], Bandit Yangphonkhan[3] Takashi Yoshikawa and Takafumi Arimoto
1 Training Department, Southeast Asian Fisheries Development Center
2 Marine Technology Faculty, Burapha University
3 Eastern marine Fisheries Research and development center, Department of Fisheries, Thailand

Introduction

The Research Institute for Human and Nature (RIHN) and Southeast Asian Fisheries Development Center (SEAFDEC) conducted collaborative project aiming to area capability building. Environmental condition survey was one of activities under this project in order to determine impact of set-nets on seawater and bottom sediment condition.

Materials and Methods

The survey was conducted just beginning of set-nets installation (October, 2013), midterm of installation (January, 2014) and end of set-net installations (April, 2014). The environmental condition surveys were carried out on board M.V. Plalung and Plamong 16. There were 22 survey stations include 8 stations around the set-net number 1, 8 stations around the set-net number 2 and 6 referent stations. Location of the survey stations is shown in **figure 1.**

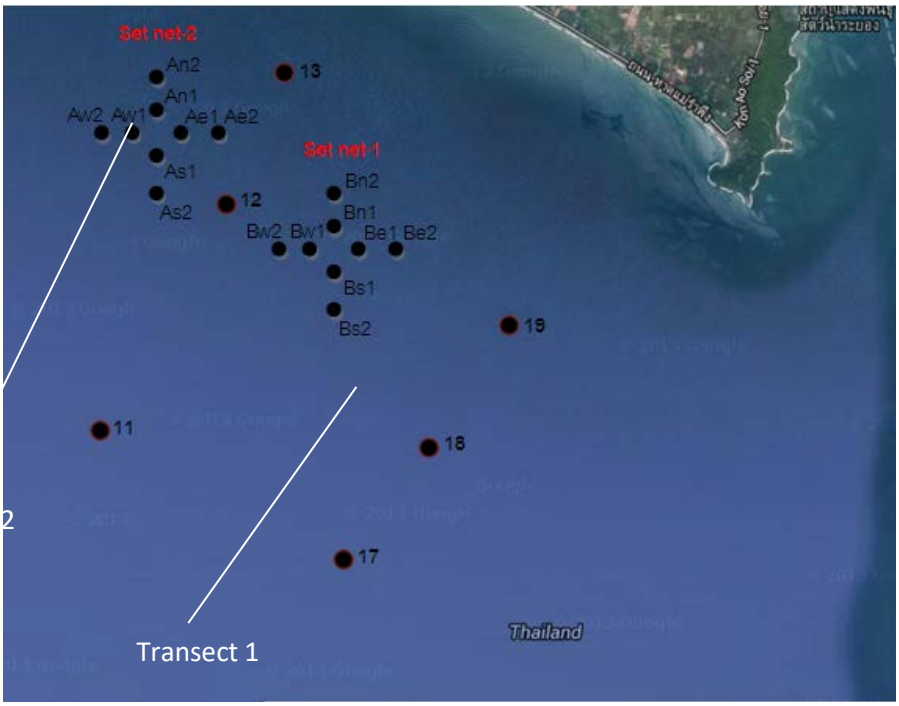


Figure 1 Sampling stations; An1, Ae1, As1, and Aw1 were at edge of sea-net 2
An2, Ae2, As2, and Aw2 were 200 m away from edge of sea-net 2
Bn1, Be1, Bs1, and Bw1 were at edge of sea-net 1
Bn2, Be2, Bs2, and Bw2 were 200 m away from edge of sea-net 1

Result and Discussion

Set-net was constructed in flat area with average depth was 12.5 meter. **Figure 2, 3 and 4** shows average temperature, salinity and pH, respectively, at around each set-net at surface, middle and bottom in the whole period. The results show that the average of water temperature, salinity and pH between edge of set-net and 200 m away from set-net were similar.

During survey period, water was well mix situation in whole water column except in October 2013 when water stratification was weakly developed. **Figure 5** shows that there was low salinity from surface to 5 meter depth. In contrast to insignificant their vertical variations, seasonal pattern can be observed in salinity and water temperature. Water temperatures from surface to bottom of the area was in the range of 30.15-34.23 ^{0}C. The highest average water temperature was in April. In January when air temperature was colder than the others, low temperature was also observed. Average salinity at the set-net site was about 33.15 psu. However, in October which is in the rainy season, low salinity water was observed at surface layer (figure 5). This low salinity might be ascribed to out flow from the Rayong River which is west of the set-net site.

Average pH at edge of set-net and 200 away from set-net ranges from 7.95-8.26. Both the lowest and highest values were found in the same month, January. At this time, ph value at the surface layer was low then suddenly increased at middle layer and slowly increases from middle to bottom layer.

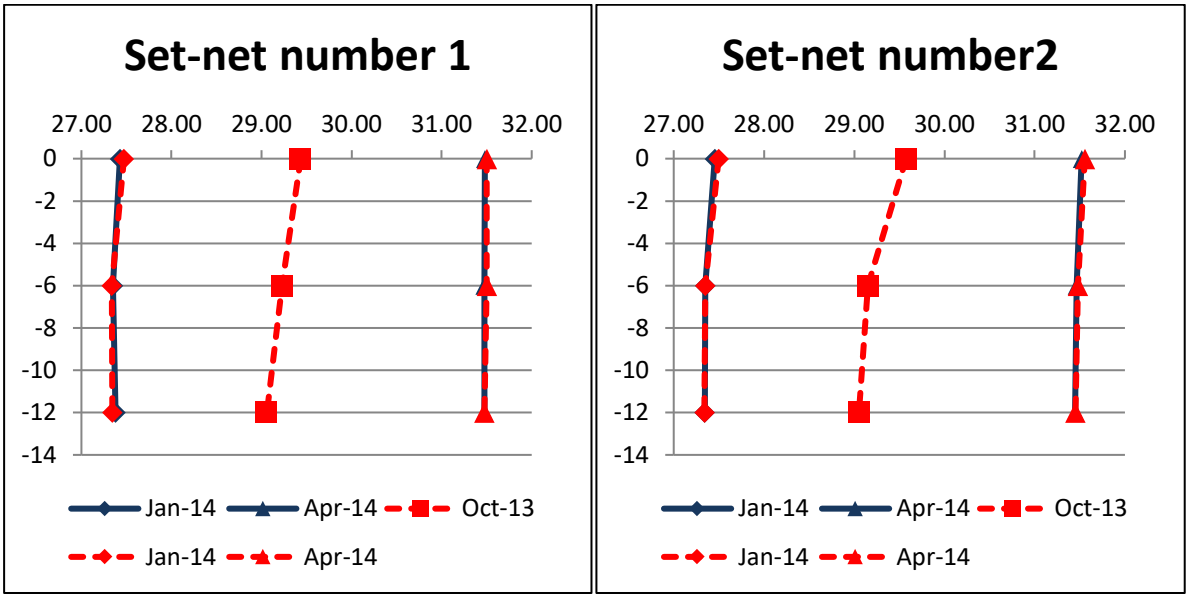


Figure **2** Temperature profile (^{0}C); Blue line is average temperature at edge of set-net and Red dash is average temperature at 200 m away from edge set-net

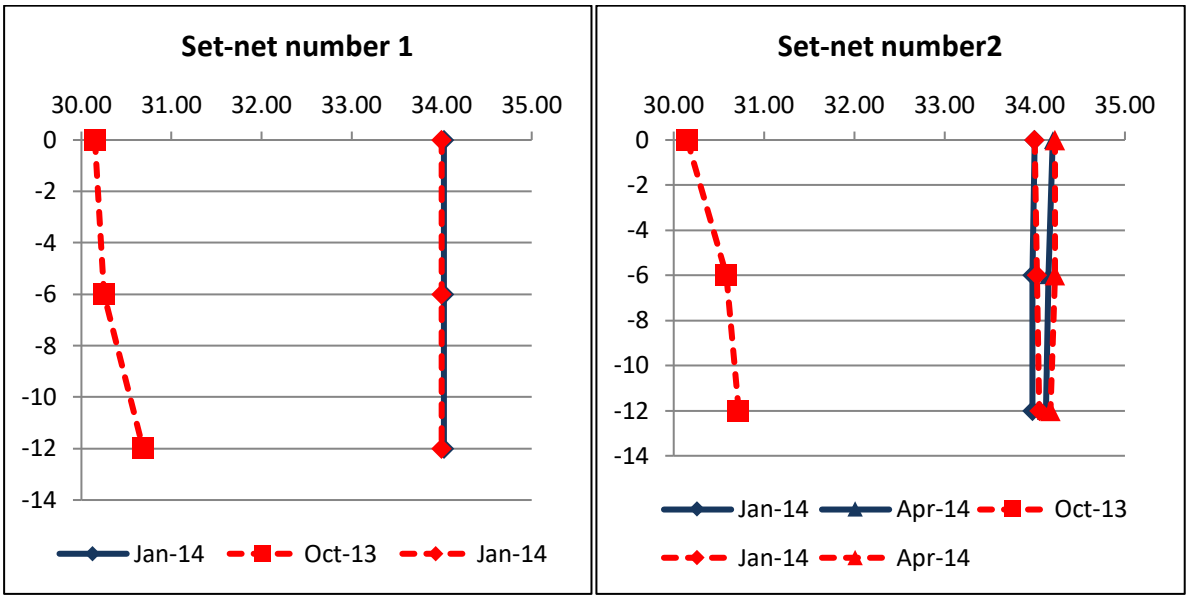


Figure 3 Salinity profile (PSU); Blue line is average salinity at edge of set-net and Red dash is average salinity at 200 m away from edge set-net

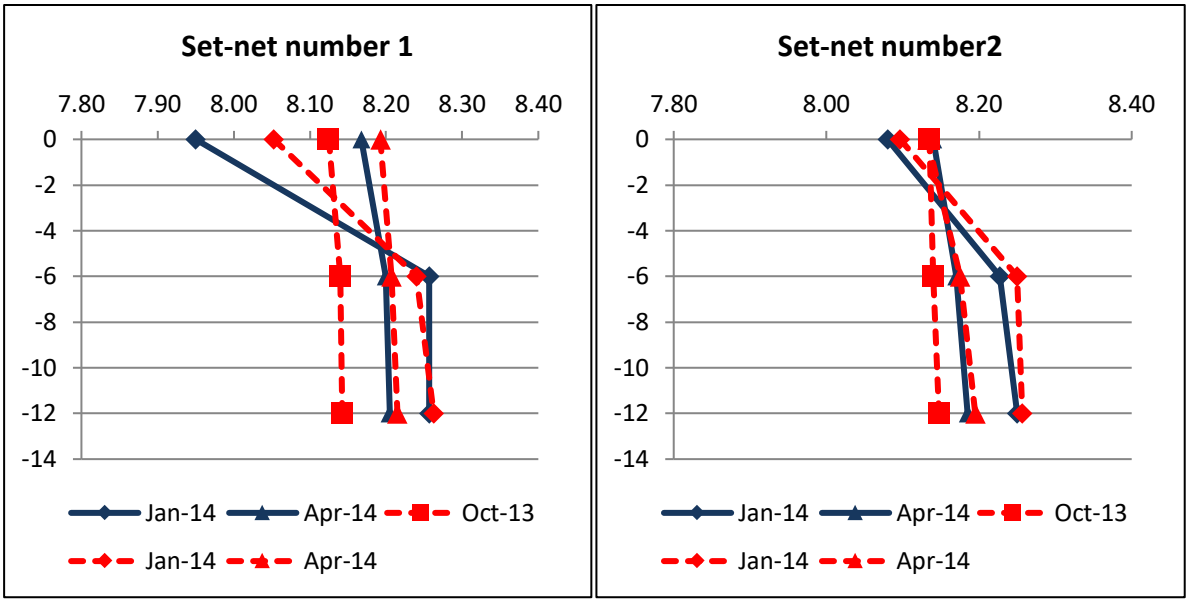


Figure 4 pH profile (PSU); Blue line is average pH at edge of set-net and Red dash is average pH at 200 m away from edge set-net

Figure 6 shows the average AVS data of set-net 1, set-net 2 and reference points. All AVS value showed constantly much lower than the criteria for identifying critical farms (2.5 mg/gdry in Yokoyama 2003). AVS in the set-net stations increased with set-net operations (0.0011±0.018 mg/gdry in 13Oct, 0.0016±0.0024 in 14Jan, 0.0034±0.034 in 14Apr), however, the differences were small compared with SD. The results of statistic t-test show that there was no significant difference among 3 month beginning of set-nets installation (October, 2013), midterm of installation (January, 2014) and end of set-net installations (April, 2014). Additionally, non-paired t-test show that no significant difference between set-net station and reference stations.

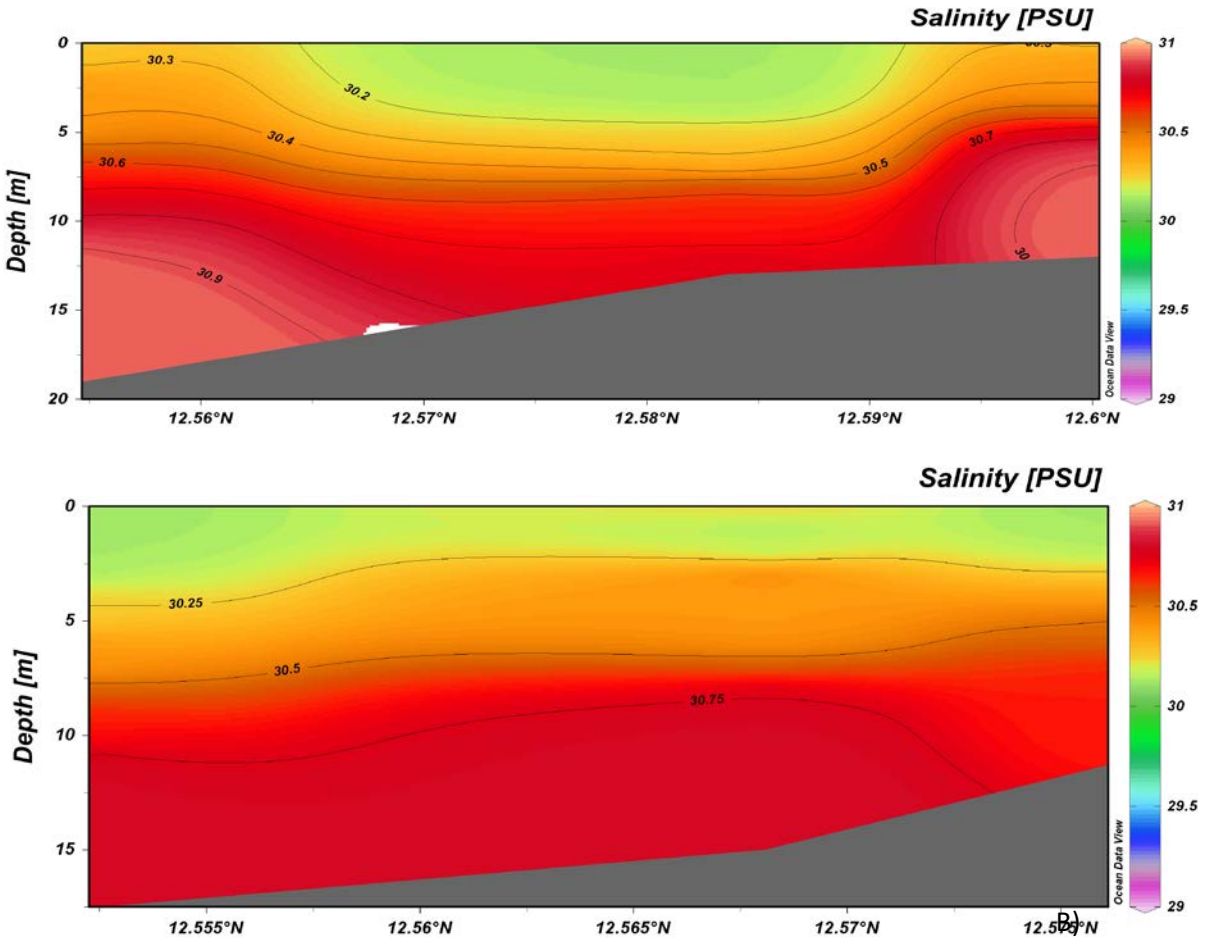


Figure 5 A) Salinity transect 1 and B) salinity transect 2 in October 2013

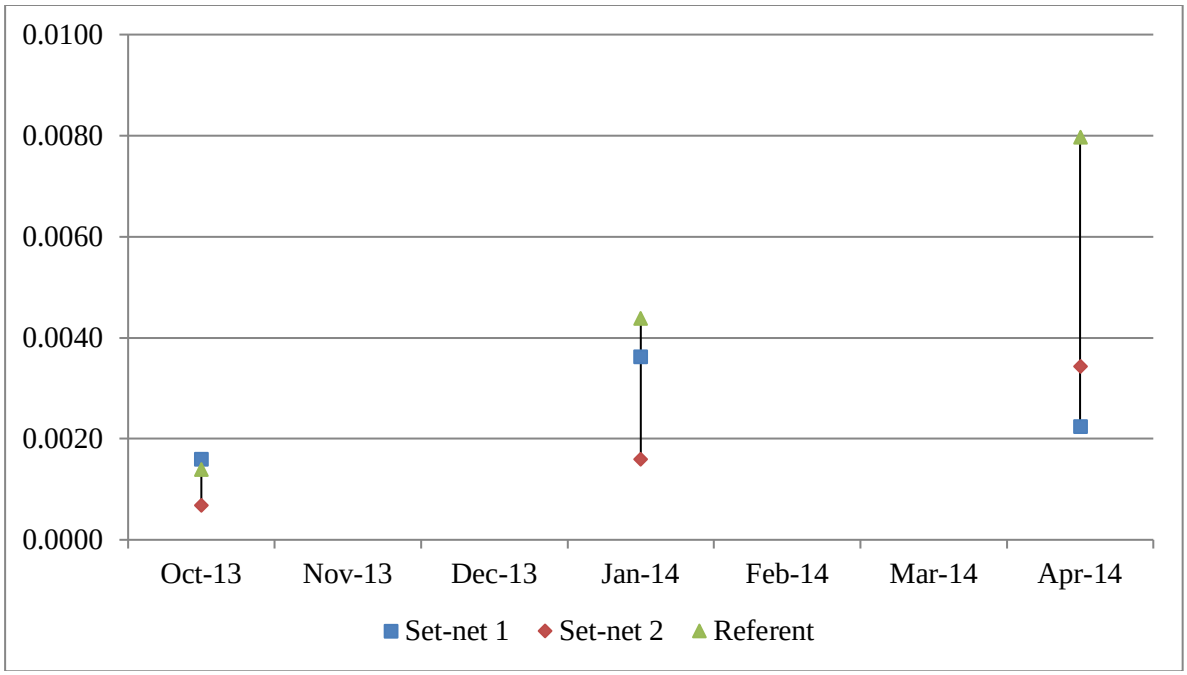


Figure 6 The average AVS data of set-net No.1, set-net No.2 and reference point

Conclusion

Base on the first year monitoring results, no significant impact of the set-net operation was observed in marine chemical and physical parameter because of 2 reasons. Firstly, results of water quality profile between edge and 200 m away from set-net showed similar value in whole survey period. Secondly, AVS around set-net among 3 month beginning of set-nets installation (October, 2013), midterm of installation (January, 2014) and end of set-net installations (April, 2014) was non-significant different. However, in order to make concluding remarks, it is better to conduct one more year monitoring for checking year to year variation.

Seasonal Variations in Water Column Stratification in the Gulf of Thailand

Pontipa Luadnakrob and Anukul Buranapratheprat
Department of Aquatic Science, Faculty of Science, Burapha University, T. Saensuk, A. Muang, Chonburi 20131, Thailand

Introduction

Water column conditions in terms of vertical well mixing and stratification are important to phases of physical and biochemical environments such as vertical material exchanges and primary productivity of phytoplankton. Water stratification plays as a barrier to nutrient mixing between surface and subsurface waters. Primary productivity in such area is then limited by nutrient availability. In contrast, the stratification in a high eutrophic area can generate hypoxia or anoxia in near bottom water due to organic material decomposition.

The objective of this study is to investigate the seasonal variations of water column stratification in the Gulf of Thailand (GoT) from the distributions of temperature and salinity profiles. Other controlling factors such as surface heat flux, freshwater discharge, rainfall, tidal and wind stirrings were also included in this study.

Methodology

The model of the rate of change of potential energy in water column (dE/dt) in this study was modified from Buranapratheprat et al. (2008). The basic of assumption of this model is that the rate of change of potential energy in water column can be considering to index of vertical stratification in the water column. When dE/dt value is higher than 0, it was consider as vertical well mixing area. In the other hand, when dE/dt value less than 0, it was consider as vertical stratification area. The model is,

$$\frac{dE}{dt} = -\frac{\alpha g Q H}{2C_p} - \frac{\beta g S H R}{2A} - \frac{\beta g S H P}{2A} + \frac{4\varepsilon k_b \rho_w U_t^3}{3\pi} + \delta k_s \rho_a W^3$$

Where

Symbols	Definitions	Values	Units
α	Thermal expansion coefficient	2.3E-04	$^oC^{-1}$
g	Gravitational acceleration	9.8	ms^{-2}
H	Water depth		m
Q	Heat flux		Wm^{-2}
C_p	Specific heat of water	3.9767	$Ws\ g^{-1}\ ^oC^{-1}$
β	Salinity contraction to density	0.001	$g\ cm^{-3}\ psu^{-1}$
S	Salinity		psu
R	River discharge		$m^3\ s^{-1}$
P	Net rain fall		$m^3\ s^{-1}$
A	Surface area under river discharge influence		m^2
ε	The efficiency of conversion from turbulenceto potential energy for tidal stirring	0.015	
k_b	Bottom drag coefficient	2.5E-03	
ρ_w	The density of seawater		$g\ cm^{-3}$

Symbols	Definitions	Values	Units
U_t	Tidal magnitude		m s^{-1}
δ	The efficiency of conversion from turbulence to potential energy for wind stirring	0.039	
C_D	Surface drag coefficient(Eq. (3a) and (3b))		
k_s	$C_D \times \gamma$		
γ	The ratio of wind-induced current to wind speed	0.0127	
ρ_a	The density of air	1.25E-03	g cm^{-3}

The surface drag coefficient (C_D) calculated from wind magnitude at 10 m above sea surface (W_{10}) by Eq. (Yelland&Taylor, 1996).

$$1000C_D = 0.29 + \frac{3.1}{W_{10}} + \frac{7.7}{W_{10}^2} \qquad (3 \le W_{10} \le 6\ ms^{-1}) \qquad \text{(a)}$$

$$1000C_D = 0.60 + 0.071W_{10} \qquad (6 \le W_{10} \le 26\ ms^{-1}) \qquad \text{(b)}$$

The data which used in this study were gather from various sources are as follow

Monthly data of salinity and temperature at water surface, 10, 20, 30, 50 and 75 m depth were downloaded from U.S. NODC World Ocean Atlas 2001 and calculated the average of weighting data. These data used to calculate sigma-t by using equation of Pond & Pickard (1983).

Monthly four heat types of surface heat flux data were downloaded from the School of Marine Science and Technology, Tokai University and were interpolated by using Gauss method in order to into the same set the coordinate with monthly salinity and temperature then calculate total surface heat flux from 4 heat types.

Monthly wind speed and direction was calculated by using average wind data during 1999 to 2009 downloaded from QuickScat and were interpolated by using Gauss method at 150 km grid size in order to set the same coordinate with other data set.

Monthly discharge data were get from Office of Water Management and Hydrology Royal Irrigation Department Thailand. They were average and interpolated data by using Gauss method at 150 km grid size, then weighting data considering to the distance from river mouth.

Net atmospheric flux calculated by volume of rainfall grid data minus volume of evaporate grid data, monthly rainfall data and monthly evaporate data during 1999 to 2009 downloaded from Ocean color and Woods Hole Oceanographic Institution, respectively.

Tidal data were from mathematic model of Yanagi and Takao (1998) (M_2 and K_1), they were calculated net amplitude each component and total amplitude and interpolated data by Gauss method.

Result

Stratification was prevalence almost all year round, except in December when mixed water column occurred in the upper gulf and along the central coast of the GoT (Fig.1). Generally during the northeast monsoon season (November – January), weak stratification occurred due to strong wind and low surface heat flux. On the other hand,

during the southwest monsoon season (May – August), and the strongest stratification showed on May, strong stratification prevailed due to high surface heat flux and high rainfall (Fig.2).

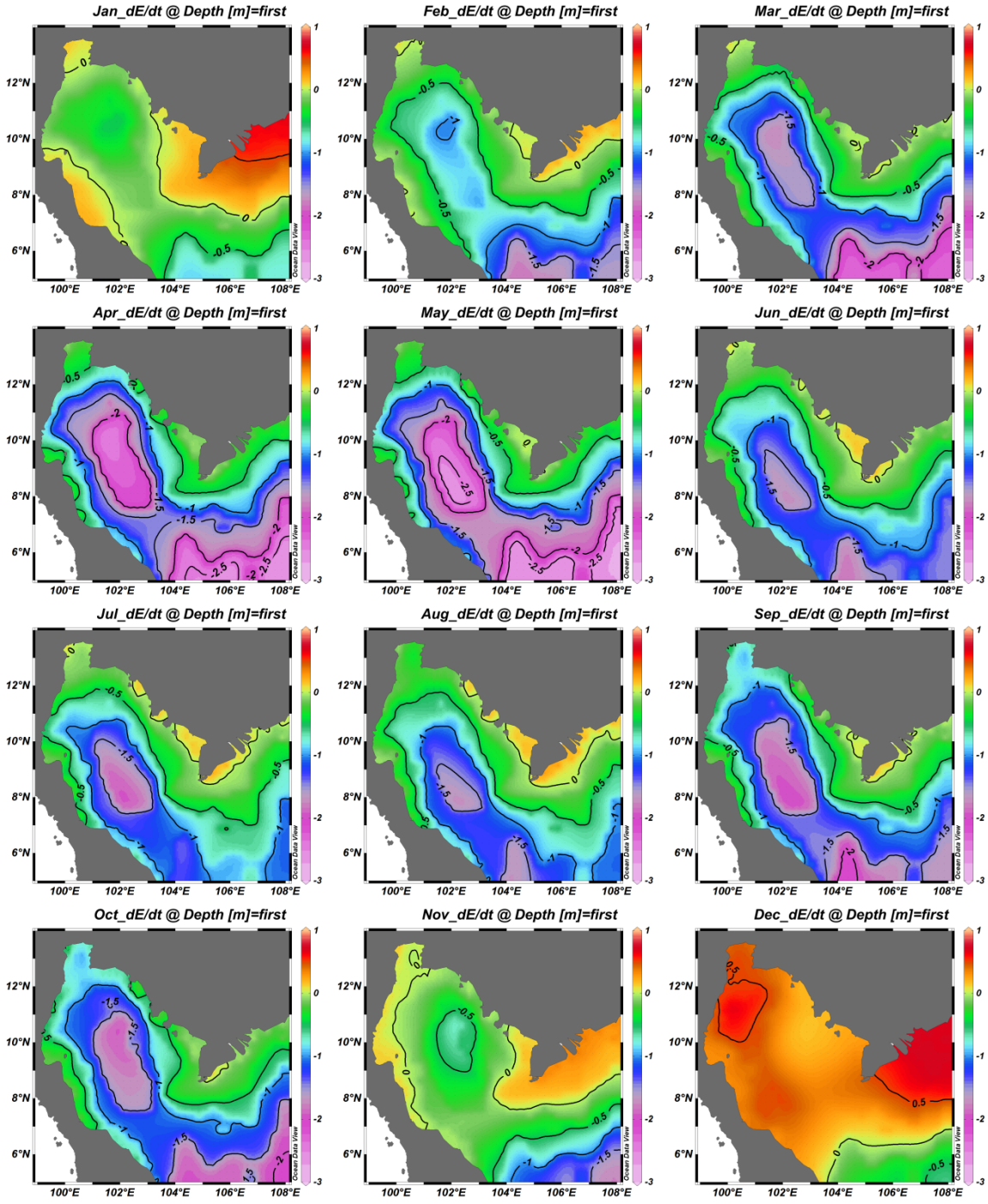


Fig.1 Monthly variations in the rate of change of potential energy in the water column in the GoT.

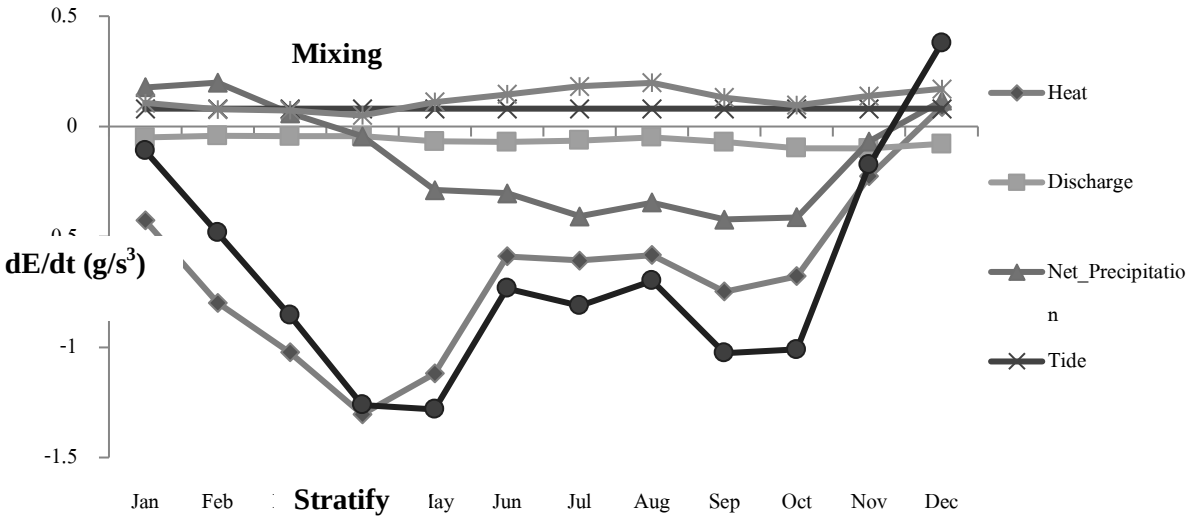


Fig. 2 Seasonal variations in the rate of change of potential energy in the water column in the GoT

Reference

Buranapratheprat, A.,Yanagi, T. & Matsumura, S. (2008). Seasonal variation in water column conditions in the upper Gulf of Thailand. *Continental Shelf Research*, 28, 2509-2522.

Pond, S., & Pickard, G. (1983). *Introdutory dynamical oceanography* (2nd ed.). England: Butterworth-Heinemann, 329 p.

Yanagi, T., & Takao, T. (1998). A numerical simulation of tides and tidal currents in the South China Sea. *Acta Oceanographica Taiwanica*, *37*, 17-29.

Yelland, M., & Taylor, P.K. (1996). Wind stress measurements from the open ocean. *Journal of Physical Oceanography*, *26*, 541-558.

Project Plan of "Study on Catch Composition in Bottom Gillnet Fisheries, Ban Phe, Rayong Province"

Nakaret Yasook

Bottom gillnet is one of important fishing gear of Thai fisheries. In year 2011, Department of fisheries, Thailand (DOF, Thailand) reports number of bottom gillnetter 7,164 fishing boats operated in Gulf of Thailand and Andaman Sea. Dominant type of gillnet is miscellaneous what majority composed with fish gillnet, 3,810 gillnetters, crab gillnet is second dominant, 2,321 gillnetters and the shrimp gillnet or trammel net is 1013 gillnetter. More than 80% of gillnetters are small scale fisher operating with fishing boat 5-10 m length overall, around the coastal area of Thailand. In coastal fisheries, length of gillnet is operate from 500-2000 m. and roughly length of gillnet operate in both Gulf of Thailand and Andaman Sea is from 3,500 – 15,000 km. Statistics of catch landing of gillnet recorded by DOF-Thailand in year 2008 shows the landing of marine product by all type of gillnet is about 85,000 metric ton, however there are none of statistic record in each particular type of gillnet.

FAO reports the incidental catches by gillnet are various species including marine mammal and seabird. However both of incidental catches caused by drifting gillnet what operated in certain fishing area. Less understanding of bycatch of bottom gillnet operated in coastal area. In fact small scale fishers are limited in fishing effort regarding to the size of fishing boat, capital investment, and number of fishers, however, with the massive quantity reflected by the total length of gillnet what calculated from statistic data, supplement by weight of landing marine product by gillnet fisheries, bycatch of bottom gillnet may occur in last volume and almost of them less valuable marine product in economic but high vulnerable to marine ecosystem. So that Investigation for bycatch in diversity and estimation of bycatch should be investigate in order to be based information prepare for further management or fishing technology development to reduce bycatch in the future.

During 2012-2015, Research Institute for Humanity and Nature (RIHN) and some Japanese Universities and Research Institutes has been undertaken the cooperative research project namely, "Coastal Capability Enhance in Southeast Asia" in corporation with the Southeast Asian Fisheries Development Center, Training Department (SEAFDEC/TD), Eastern Marine Fisheries Development Center (EMDEC) of Department of Fisheries-Thailand, Faculty of Fisheries, Kasetsart University (KU). It is very good opportunity for junior researchers of EMDEC of DOF-Thailand, SEAFDEC/TD, KU to corporate study on various project in related with Area Capability of Set Net, Rayong province. The Study on Catch composition in Bottom Gillnet Fisheries in Ban Phe, ayong Province is able to fulfill the information of catch composition of bottom gillnet of study area and reflect the estimation of bycatch of bottom gillnet in Eastern Gulf of Thailand and fishing technology to improve bycatch selectivity in the future.

Evaluation of capacity building on offshore and high sea fisheries management and reducing IUU fishing activities in SEAFDEC Member Countries

Kongpathai Saraphaivanich, Yanida Suthipol and Namfon Imsamrarn

Introduction

In every country in the Southeast Asian Region, efforts are now focusing on the promotion of sustainable fisheries management and countermeasures against IUU fishing. The recognizes fishing management schemes such as fishing license, boats registration and etc. as effective measures to promote the sustainable use and the long-term conservation of marine living resources. Following the direction of Resolution and Plan of Action, the SEAFDEC Training Department (TD) has been implemented the project of "Promotion of Countermeasures to reduce IUU Fishing", aim to collaboration with Member Countries to reduce IUU fishing in the region. An activity in this project is strengthening of Port State Measures and other surveillance measures in the region. Under this activity, the on-site training on offshore and high sea fisheries management and reducing IUU fishing activities was organized in Indonesia, Malaysia and Myanmar in 2013 and 2014. During on-site training, the evaluation of understanding on related training subject was carried out by pre and post evaluation. Aim to assessment effective of training which imparts knowledge and understanding to trainees.

Methodology

1. Evaluation sample and factor control

The on-site training on offshore and high sea fisheries management and reducing IUU fishing activities was organized in three SEAFDEC Member Countries, namely: Indonesia; Malaysia; and Myanmar. A number of trainees in total are 102 trainees. All on-site training is same module. The factor control is training subjects, resource persons, and trainees who are fisheries officer level.

2. Design of evaluation form

The pre and post evaluation form was designed which five main training subjects are as follows: Important role of resource management for sustainable fisheries; Monitoring, Control and Surveillance (MCS) measurement for offshore and high sea fisheries management; Offshore and high sea fisheries management and co-management; International and regional activities to combat IUU fishing; and Countermeasures (catch documentation scheme, port surveillance and vessel record) to reduce IUU fishing activities. Each subject has five column of knowledge and understand rating of trainee pre and post training such as not understand, less understand, moderate understand, much understand and very much understand. The trainees gave rating in the appropriate column to indicate their knowledge and understanding.

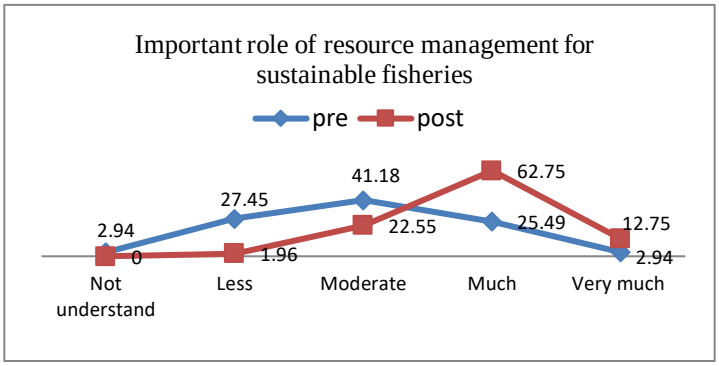
3. Process of data analysis

The raw data of the pre and post evaluation is analyzed into percentages and compare each other to assessment effectives of imparts knowledge and understanding which to trainees via training**.**

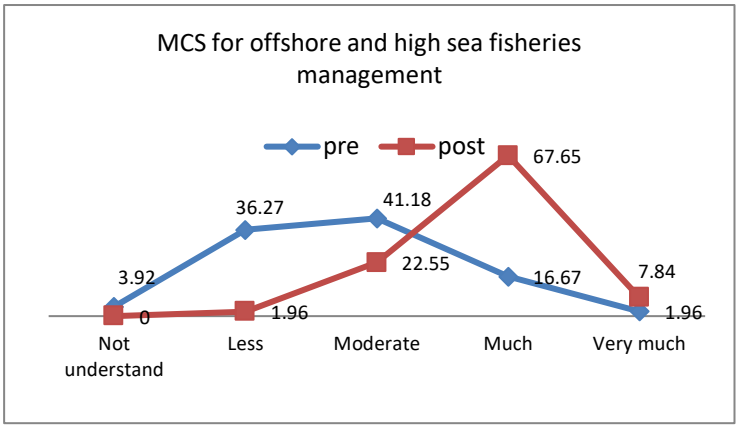
Result

1. Understanding on important role of resource management for sustainable fisheries

Before attend the training, most of trainees about 27.45 and 41.18% are less and moderate understanding respectively on the subject of important role of resource management for sustainable fisheries. Then after attended in the training, 75.50% of trainees are much and very much understanding in this subject.



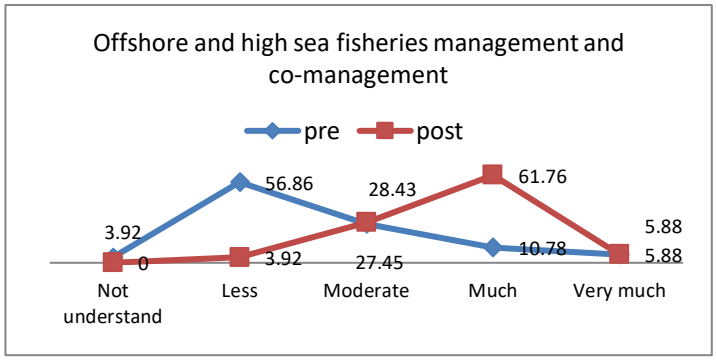
2. Understanding on Monitoring, Control and Surveillance (MCS) measurement for offshore and high sea fisheries management



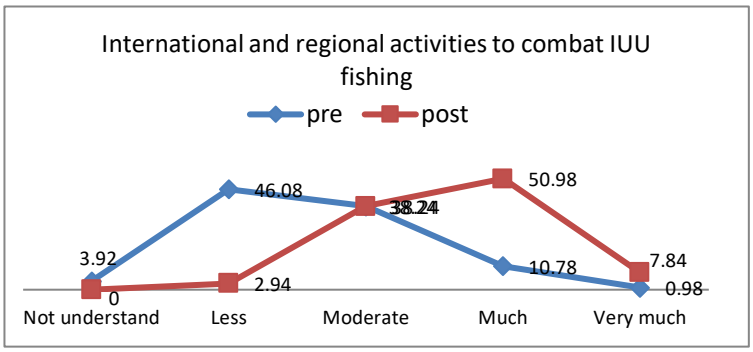
The pre-evaluation of understanding on MCS measurement for offshore and high sea fisheries management, most of trainees about 36.27 and 41.18% are less and moderate understanding respectively on this subject, while after attended in the training, 67.65% of trainees are much understanding.

3. Understanding on offshore and high sea fisheries management and co-management

The understanding on offshore and high sea fisheries management and co-management before attend the training, most of trainees about 56.56 and 27.45% are less and moderate understanding. After attended in the training, 61.76% are much understanding in this subject.



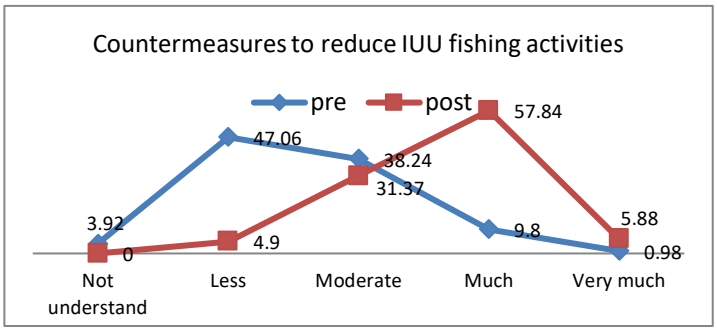
4. Understanding on international and regional activities to combat IUU fishing



Before attend training, most of trainees about 46.08 and 38.24% understanding on international and regional activities to combat IUU fishing are less and moderate respectively. After attended training, most of them are much understanding in this subject.

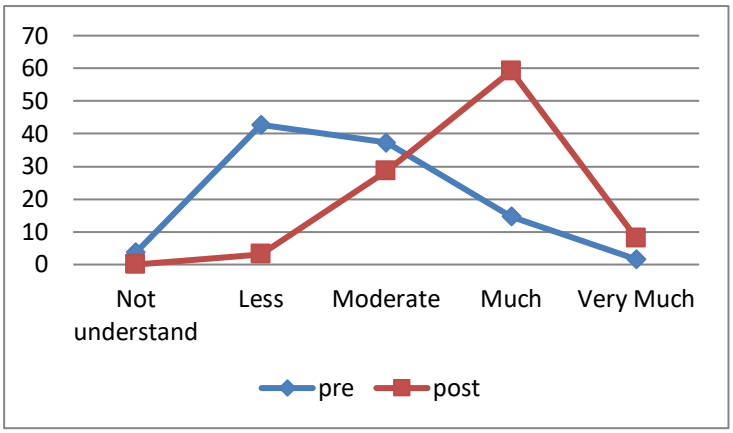
5. Understanding on countermeasures to reduce IUU fishing activities

The subject on countermeasures to reduce IUU fishing activities before attend training, most of trainees are less and moderate understanding about 46.08 and 38.24% respectively. After attended, half of trainees are much understanding in this subject.



Conclusion

The average of five subjects in on-site training on offshore and high sea fisheries management and reducing IUU fishing activities, before attend in the training, most of trainees are not, less and moderate understanding in these subjects (peak at less understanding). However, after attended training, the knowledge on these related subjects were built up and imparted to their knowledge and capacity. Most of them are moderate, much and very much understanding on the related subjects (peak at much understanding). Therefore, the on-site training on offshore and high sea fisheries management and reducing IUU fishing activities is effectively to awareness and capacity building common knowledge and understanding to Member Countries as a tool to reduce IUU fishing activities in the region.



Development and Management of Database on Regional Fishing Vessel Record (RFVR) as a Tool to Combat IUU Fishing

Namfon Imsamrarn, Kongpathai Saraphaivanich, Yanida Suthipol and Bundit Chokesanguan

Introduction

Illegal, Unreported and Unregulated (IUU) fishing can take place in all capture fisheries. Efforts to conserve and manage fish stocks are undermined by IUU fishing, which can lead to the collapse of fisheries or can seriously impair efforts to rebuild fish stocks that have already been depleted. This may result in the loss of both short and long-term social and economic opportunities and could have negative impacts on food security. Considering the IUU fishing activities occurred in the region mostly found in forms of pouching, double flagging, across-border of fishing boat for fish landing (SEAFDEC, 2014). In this regard, the SEAFDEC Training Department has been implementing the project of "Promotion of Countermeasure to reduce IUU fishing" since 2012, one of the main activities is to establish the Regional Fishing Vessel Record (RFVR) as a management tool to reduce the such IUU fishing activities as above mentioned. In this regards, the ASEAN Member States (AMS) agreed that the fishing vessels to be included in the system are the vessels of 24 meters in length and over for the 1st phase. It is therefore in order to increase the effectiveness management of the RFVR of 24 meters in length and over, the database management system is needed.

Methodology

The steps of developing the database system of the RFVR for 24 meters in length and over are described as follows:

1) Reviews the current status of the fishing vessels in each ASEAN Member States and identify the basic data requirements through the series of Expert Consultations. This process includes the consultation with ASEAN-SEAFDEC Member Countries in order to gather the agreed sharing of data and information of the fishing vessels to be included in the RFVR system.
2) Development of the database system for RFVR 24 meters in length and over using the System Development Life Cycle (SDLC). It consisted of seven phases for systems analysis as follows;
   - **i)** **Planning**: Definition of system and scope of database used by AMS was developed
   - **ii)** **Systems Analysis**: Gathering and analyze the 26 items of basic information requirement from AMS as agreement which compare the existing fishing vessel records by other organization such as IOTC, WCPFC, CCAMLR, and IATTC.
   - **iii)** **Systems Design**: After the analysis step, the RFVR database system was designed based on the fishing vessel records developed by WCPFC (Western Central Pacific Fisheries Commission).
   - **iv)** **System Development:** this is a process on developing or writing the database system for RFVR based on the first three steps mentioned before.
   - **v)** **Testing**: After 1st draft of the database system is completed, the sample data from each country were inputs for testing the system.
   - **vi)** **Implementation**: The finalized database system is then used for inputs all data provided by AMS. It is planned that the completed database system will be launched at the 47th Meeting of the SEAFDEC Council in April 2015. Login account and password to access the database system for RFVR 24

meters in length and over will be given to all AMS. This is a closed system for AMS only, unless the AMS agreed to publicize world wide or international level.

vii) **Maintenance the system**: It is agreed that the data and information of the RFVR for 24 m in length and over will be regularly updated. Therefore the maintenance of the database will be looked after by the Training Department as the center and manager of the database system.

Results

1) 26 basic information requirements of RFVR for 24 meters in length and over:

26 basic information requirements of RFVR for 24 meters in length and over was agreed by AMS to be shared within the ASEAN region as shown in table 1

Table 1: Basic information requirements of RFVR for 24 meters in length and over

Information on fishing vessels	Information on fishing vessels
1. Name of vessel	14. Engine Brand
2. Vessel Registration Number	15. Serial number of engine
3. Owner Name	16. Hull material
4. Type of fishing method/gear	17. Date of registration
5. Port of registry	18. Area (country) of fishing operation
6. Gross tonnage (GRT/GT)	19. Nationality of vessel (flag)
7. Length (L)	20. Previous name (if any)
8. Breadth (B)	21. Previous flag (if any)
9. Depth (D)	22. Name of captain/master
10. Engine Power	23. Nationality of captain/master
11. Shipyard/Ship Builder	24. Number of crew (maximum/minimum)
12. Date of launching	25. Nationality of crew
13. International Radio Call Sign	26. IMO Number (If available)

2) Structure of the Database System for RFVR 24m in Length and Over:

The main structures of the RFVR database system are divided into 3 parts as follows: 1) Data Search, 2) Result, and 3) Export Data.

2.1) Data Search

This part allow user to search for the information of vessel based on 5 parameters such as a) vessel flag, b) vessel type, c) year of registration, d) vessel name, and e) local vessel name. In the system, the vessel type searching is created based on the categories of type of fishing gears and methods as shown in Table 2. In accordance to this, the vessel types used in the system are included Purse seiner, Stick held dip netter, Gillnetter, Trawler, Longliner, Trap, and Carrier as shown in Table 2.

Table 2: the categories of type of fishing gears and methods

Country	Type of fishing method/gear	Vessel Type
Indonesia	Purse Seine (PukatCincin)	Purse Seiner
	Pelagis Kecil	
	Bouke Ami (Stick Held Drift Net)	Stick held dip netter
	JaringInsang (Gillnet) HanyutDasar / Liong Bun	Gillnetter
Malaysia	Fish Purse-Seine	Purse Seiner
	Trawl Nets	Trawler
	Anchovy Purse-Seine	Purse Seiner
	Hook & Lines	Longliner
	Transport	Carrier
Myanmar	Trawler	Trawler
	Stow	Stow netter
	Purse Seiner	Purse Seiner
	Trap	Trap
	Drift	Gillnetter
	Long Line	Longliner
Thailand	Gillnets	Gillneter
	Purse seine	Purse Seiner
	Otter board trawls	Trawler
Viet Nam	pair trawl fishing	Trawler
	single + pair trawl fishing	Trawler
	fishing logistic	Carrier
	hook and line	Longliner

2.2) Result

This part shows the result from searching, split it on multiple pages limit the query to show only 20 records and display it using page numbers. Information in the result table is such as Vessel Flag, Registration Number, Vessel Name, Local Vessel Name, Type of Fishing Gear, Year of Registration, and Length. User can get more detailed information of each vessel by click icon, and then the result will shown in a new webpage of detailed information for particular/selected vessel.

2.3) Export Data

This part is for exporting the selected data from searching to excel format data sheet by click excel icon or command to print all data as hard-copy by click print icon)

3) How to Access to the Database System for RFVR 24 meters in length and over:

For security purpose, access to the SEAFDEC database system of the RFVR for 24 meters in length and over is required user name and password that will be provided to responsible focal point of AMS after all required data are received from all relevant AMS and are completely input into the system.

4) Management of the Database System of RFVR for 24 meters in Length and Over:

Maintenance and management of the database system of RFVR for 24 meters in length and over are discussed among the AMS. The conclusions are as follows:

- Updating the list of fishing vessels: it was agreed by the AMS that the list of fishing vessels should be updated annually to have more effective tools to be used for combating IUU fishing.
- National focal point: To make a smooth collaboration with AMS, therefore a country focal point would be nominated by AMS.
- Identify users at country level: the specific users at AMS maybe need to be identified in consultation with National Focal Point.

- Increasing important information element of fishing vessel to increase effectiveness of the tools: This matter will be depended upon the future activities.

Reference

1. SEAFDEC 2014, ASEAN Guidelines for Preventing the Entry of Fish and Fishery Products from IUU Fishing Activities into the Supply Chain
2. Study Mode [homepage on the Internet]. The Seven Phases of the Systems Development Life Cycle, [cited 2014 May 1]. Available from : http://www.studymode.com/essays/The-Seven-Phases-Of-The-Systems-163461.html
3. WCPFC Record of Fishing Vessels [homepage on the Internet]. Western & Central Pacific Fisheries Commission, Inc.; c2014 [cited 2014 June 1]. Available from : https://www.wcpfc.int/record-fishing-vessel-database

Fisheries Resource Management and Fisheries Information
Lesson learned from Japan

Woraluk Meesomwat

Introduction

Regarding to the arrangement under the Business Consignment Agreement between SEAFDEC and Marino-Forum 21 singed since 2014, I was selected as one of the trainee to participate in Fisheries Resource Management and Fisheries Information program. Duration of my training course was from 13 October 2014 to 1 November 2014.

In this training course, I've gained knowledge of fisheries management in many kinds of different aspects. First of all I had an opportunity to learn about marine protected area and related issue from The University of Tokyo, current situation on fisheries and fisheries statistics from Fisheries Agency, fisheries management and fisheries activities from Ishikawa and Yamaguchi prefecture.

Furthermore, I've learned how to make use of information from catch and biological data including appropriate collection system for stock assessment from Research Institute of Fisheries Science that is very important to support the effectiveness of fisheries management in Japan.

Lastly, I have a chance to observe some lecture on project evaluation case study from Japan International Cooperation Agency (JICA) and Marine Blue Association. Introduction of various type of artificial reef and its effect from Marine Civil Engineering Co., Ltd.

Training Schedule

Date	Institution	Content
14 Oct 2014	Marino-Forum 21,Department of Overseas Fisheries Consultanting Activities(OFCA)	Observation Tsukiji Market and Lecture : Distribution of fisheries production
	Department of Global Agricultural Sciences ,The University of Tokyo	Laboratory introduction Lecture : MPA and Related Issues
15 Oct 2014	Fisheries Agency Administration Division	Structure and works of Fisheries Agency of Japan
	Policy Planning Division	Current situation of fisheries in Japan
	Fish Ranching and Aquaculture Division	Fish Ranching and Aquaculture in Japan
	Statistic Division	Fisheries production Statistic
16-17 Oct 2014	FRA, National Research Institute of Fisheries Science	・Stock assessment ・Stock management ・Fisheries biology ・Monitoring system
20 Oct 2014	- Japan International Cooperation Agency (JICA)	・Outline of Japan's ODA and JICA Cooperation ・JICA's Project Evaluation and Monitoring System
	- Japan Fisheries Information Service Center (JAFIC)	・Concept of TAC and TAE ・Management system

Date	Institution	Content
21 Oct 2014	Marine Blue Association	Marine Blue Association and Method of Evaluation
23-24 Oct 2014	Ishikawa prefecture Government	・Fisheries Management in Ishikawa prefecture. ・Activities introduction (TAC management, Boat registration, Resources recovery plan, Fish ranching, Fisheries infrastructure, Instruction of fisheries association) ・Observe fisheries petro boat, Fish Farming Center and Fisheries Research Center
27-29 Oct 2014	Yamaguchi Prefectural Government	・Prefectural plan of fisheries promotion ・Activities introduction (Resource Management Approach, Management of fishing ground and Fisheries Rule) ・Study visit to Fisheries Cooperative Association ・Observe Fishery Research Vessel, Fisheries Research Center (Japan Sea) and Fisheries Research Center (Inland sea)
31 Oct 2014	Fisheries Agency Administration Division	Evaluation meeting
	Marine Civil Engineering Co., Ltd	Introduction of various type of artificial reef and its effect.

According to lesson learned from Japan I've learned the importance of data collection as an effective tools for fisheries resource management. Stock assessment is an importance tools to archive fisheries resource management. Catch of an appropriate age and size of target is able to secure the reproductive capacity of the stock to ensure sustainable levels of future recruitment.

National Research Institute of Fisheries Science which is in charge of stock assessments, studies on stock management, prediction of fishing condition, and biological characteristics of commercially importance small pelagic fish resources to ensure sustainable yields on their 5 responsible species especially chub mackerel.

They provide the basic methodology to enforce resource management based on annual calculation of Allowable Biological Catch (ABC), different calculation rules should be selected depending on the variety and quantity of available information. The information which is incorporated into the stock assessment are (1) research survey by vessels are collected by scientists conducting resource surveys such as biological information of target species (ecology, distribution, growth and reproduction etc.) and environmental information of surrounding ecosystem and (2) commercial fishery information is collected directly from the commercial fisheries such as catch quantity, effort quantity, fishing method, fishing gear and fishery season. All data set was aggregated to the database FRESCO.

FRESCO (Fishery Resource Conservation) server has been installed in the Japan Fisheries Information Service Center (JAFIC) to collect fishing and oceanographic

information by obtained data from Prefectural Office and Fisheries Experimental Station located throughout the country.

The mathematical method to estimate stock they used Virtual Population Analysis (VPA) model to calculate relative abundances and use to estimate future abundance. After calculating the range of allowable catch for a species then they decide ABC.

Planning, Monitoring and Evaluation System: Lessons Learned From Fisheries Research Agency (FRA) in Japan

Suwanee Sayan

Introduction

Referring to the Report of its 32nd Meeting, the SEAFDEC Program Committee pointed out the need to establish a monitoring and evaluation (M&E) system within SEAFDEC to assess the outcomes and outputs of its programs and their contributions to fisheries development of the region. Moreover, during the 45th Meeting of the SEAFDEC Council, concern on the lack of overall strategy for activities conducted by SEAFDEC was raised while linkages among the SEAFDEC programs should be clarified in order that the programs could be implemented in a more coherent and strategic manner.

Monitoring and evaluation (M&E) system is critical in carrying out a project effectively and efficiently, boosting accountability to beneficiaries, donors and other stakeholders. In particular, an M&E system helps to determine if the project is on is track, on-time, and on-target; ensure that funds are used as intended, the project/program implemented as planned; and unveil whether the program/intervention has made a difference. Carrying out an M&E of any project could is crucial to assess that a project is achieving its set targets. For instance, monitoring the development of a project would make it easier to understand whether strategic changes have to be made and actions could be undertaken accordingly. Results of the M&E would help donors in assessing whether in the organization implementing the project could be a reliable partner because by reviewing milestones and final outcomes of projects, other sources/organizations would decide on the accountability of the organization, upon which further collaborations could be established. As such, developing a strong M&E plan is of vital importance. In addition, evaluation would help to clearly envision the milestones of a project and the final outputs that strengthen the overall consistency of the project proposal. Moreover, evaluation also ensures that other sources/organizations have concrete ways of assessing the partial and final results of the project, thus contributing to guarantee a successful communication.

In the past, the proposed projects of SEAFDEC do not indicate at the proposal stage the need to address the requirements of other sources/organizations. As a result, in most SEAFDEC project proposals, the objectives, outputs, outcomes, and achievements could not be assessed, it would be difficult to monitor and evaluate the project as a whole. However, some SEAFDEC projects have undergone yearly evaluation by external evaluators, who are usually experts from Thailand, Philippines and Japan. In was through such process that the evaluators pointed out the need for continued monitoring of the projects' implementation and for evaluation to be conducted to be able to assess the targets of the projects such as the objectives, outputs, outcomes, achievements, etc. Thus, improvement of the overall planning, monitoring and evaluation of SEAFDEC programs/projects had been recommended especially linking these to the overall goal of SEAFDEC.

In this connection, SEAFDEC under the JTF arranged a special training course for some SEAFDEC staff to visit the Fisheries Research Agency in Japan and other concerned institutions for them to learn how the FRA manages their fisheries activities effectively through proper planning, monitoring and evaluation system. In this paper, the author intends to share the lessons learnt from FRA and examines the ways and means of applying these to the evaluation system of SEAFDEC.

Methodology

In order to understand the evaluation system of FRA, It is necessary to understand its general structures. FRA has 10 research institutes and 45 small stations in strategic areas around Japan (Figure i). FRA conducts a wide range of research and development activities from basic and applied science to practical technologies concerning fisheries to secure a stable supply of fisheries products and for the sound development of fishery industry, as stipulated by its Basic Plan for Fisheries Policy. The Operating Plan of the FRA is reviewed every five years, and is set based on the medium-term goals outlined by the Minister of Agriculture, Forestry and Fisheries, of which the Third Five-year Plans has been established in April 2011.

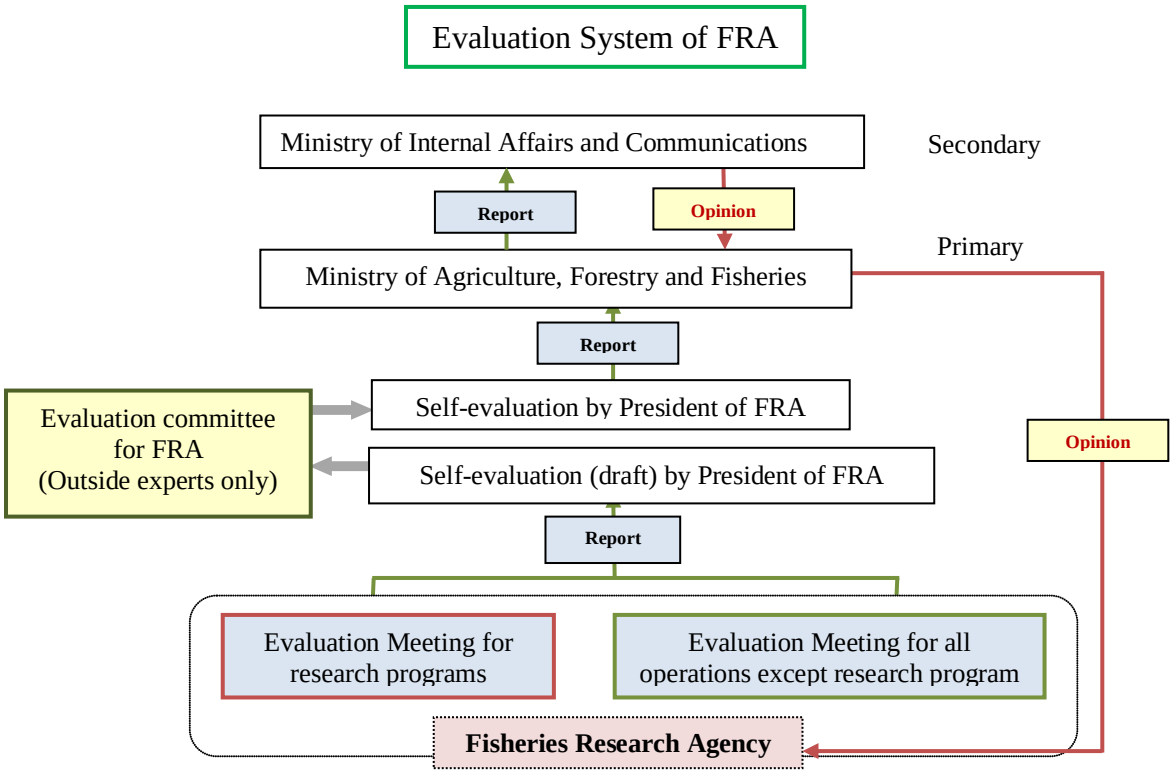
Results

The 3rd Five-year Plan includes five research components, namely: i) Developing Conservation Technologies for the Sustainable Use of Fishery Resources Both Domestically around Japan and Internationally, ii) Developing Stock Enhancement, and Rational Use of Fishery Resources, and Environment Conservation Technologies for the Promotion of Coastal Fisheries, iii) Establishment of Productivity Improvement and Environmental Friendly Technologies for Sustainable Development of Aquaculture, iv) Research and Development for the Development of Fishery Industry, Safety of Fishery Product and to Maintain Consumer Confidence, and v) Monitoring, and Basic and Pioneering Research. The main research component is Component ii) on Developing Stock Enhancement, and Rational Use of Fishery Resources, and Environment Conservation Technologies for the Promotion of Coastal Fisheries.

In 2013, FRA categorized its funds into 2 types: for operations which was 32 Million USD and commissioned projects 36 Million USD. FRA has 4 committees undertaking the evaluations: i) Prior Evaluation, ii) Annual Evaluation, iii) Interim Evaluation, and iv) Post-project Evaluation (Follow-up Evaluation). For Research, evaluation includes Outcome Point of Views in terms of Roadmap, Management, and Output. Roadmap focuses on constitution, outcomes, and social needs, Management on progress and allocation of a budget, and Output focuses on scientific articles, social needs, and secondary results among others.

For research program, project leaders send report to the President of FRA for draft self-evaluation by rank and score, and the draft self-evaluation is then sent to evaluation committee for FRA (outside expert only). The score rank used is SABCD system (S=4, A=3, B=2, C=1, D=0) and then send report and the result of evaluation to the President of FRA who decides whether the score of the program based on the results is accurate. After that, the final report will be sent to the Ministry of Agriculture, Forestry and Fisheries and then send to the Ministry of International Affairs and Communication for comments. If the Ministry of International Affairs and Communication have any comments, these will be sent to FRA through the Ministry of Agriculture, Forestry and Fisheries for improving the efficiency of the research program.

Most of research programs come from the research institutes of FRA. While the Evaluation Meeting for all operations except research program which most of the program under headquarters of FRA would use the same system with the research program. (Figure ii)



ii) Evaluation System of FRA

The evaluation system of FRA includes 6 parts, namely: i) Report of the result of the study, ii) Evaluation sheet, iii) Report of the Result and the evaluation, iv) Self-evaluation, v) Evaluation of Large category, and vi) Comprehensive Evaluation. After completing the evaluation system, the results would be uploaded to FRA website for compilation and development of database.

The lessons learnt from FRA provided the new visual and improved the knowledge on the evaluation system for the implementation of programs. In addition, the lessons leant increased the knowledge and more understanding on the program planning and evaluation system. Finally, it is expected that such important knowledge could be applied in monitoring and evaluating the programs and projects of SEAFDEC and can be used for developing the database of SEAFDEC programs based on the results of the evaluation.

Training Visit on Fisheries Resource Management and Fishing Ground Improvement/Creation in Japan

Weerasak Yingyuad
Training Department, Southeast Asian Fisheries Development Center (SEAFDEC/TD),
weerasak@seafdec.org

Introduction

In October 2014, I got the training visit scholarship in Japan by SEAFDEC human resource development program under the agreement signed between SEAFDEC and MF21 in year 2014. The training title is "Fisheries Resource Management and Fishing Ground Improvement/Creation" with 20 days training period from 13 October to 1 November 2014. The training program was included lecture, research method practice, filed visit and discuss with fisheries expertise.

Objectives

1. Improved and gained new knowledge in the present situation of fisheries in Japan
2. Improved and gained new knowledge in critical fishing ground management and management tools such as MPAs or fishery *refugia* management
3. Improved the knowledge in fisheries resource re-stocking and community based on resource management for the coastal small-scale fisheries
4. Improved and gained new knowledge in advance technology and methods of coastal resource enhancement and artificial reefs management

Outline of the training schedule

The training period was 20 days from 13 October to 1 November 2014. The training program was provided many places to visited to learn various concepts of fisheries management and resource enhancement by various organization as; Fishery Agency, Fishery department of prefectural government, Fishery Research Agency, prefectural fisheries research station, university professor, university researchers, private sector, fisherman, NGO,

I could visit to 5 prefectures, 16 places in Japan as;

1. Tsukiji Market Observation and Distribute of fisheries Product in Japan
2. MPA and related issues
3. Fisheries Agency of Japan
4. Research Center for Sub Tropical Fisheries, Seikai National Fisheries research Institute, Fisheries Research Agency, Ishigaki Island
5. Local fish market at Ishigaki Island (field observation) and local fishermen for Interviewing
6. National Research Institute of Fisheries and Environment of Inland Sea, Japan Fisheries Research Agency, Hiroshima
7. NPO Satoumi Research Institute
8. Ocean Construction Co. Ltd
9. National Fisheries University of Japan
10. Nishimo Co., Ltd
11. Yamaguchi Prefectural Government
12. Yamaguchi fishing port (Fisheries Cooperative Association)
13. Yamaguchi Prefecture Fisheries Research Center (Japan Sea)
14. Yamaguchi Prefecture Fisheries Cooperative Association (Shimonoseki)
15. Yamaguchi Prefecture Fisheries Research Center (Inland sea)
16. Marine Civil Engineering Co., Ltd

Interesting Topics

1. Research Center for Sub Tropical Fisheries, Seikai National Fisheries research Institute, Fisheries Research Agency, Ishigaki Island

Instructor: Dr. Atsushi Nanami

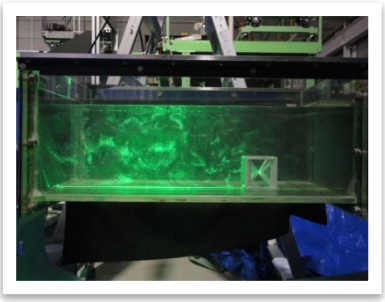
Management rules for sustainable coastal fisheries in Okinawa coral reefs: The fisheries management rules here could divide by 2 groups as; legal rule that control by Okinawa Prefectural government and Voluntary rule that control by local fishermen themselves. The legal rules were gear restrictions, catch restrictions, size restrictions, closing seasons and no-take zones. The voluntary rules were no-take zone, size restrictions and spawning ground protection.

A case study of voluntary management by local fishermen: Grouper, 2nd ranking important species in Okinawa, was catch by spear fishing. Spear fisherman, about 80 fishermen, found that groupers had aggregating behavior for breeding during last-quarter moon of April and/or May. Then spear fishermen agreed to established closing- period to stop fishing for 7 days during spawning of grouper, 3days before and after the last-quarter moon of April and/or May, by voluntary rule.

Importance of habitat conservation for effective fisheries management: The fisheries habitat management was used stomach contents analysis of fishes to study and understand the relationships of pray and predator of target species. Then, the manager could design important habitat such as; spawning ground, nursery ground and feeding ground of target species.

2. Artificial reef research in National Fisheries University of Japan

Instructor: Dr. Akira Hamano, Dr. Kimiaki Nagamatsu and Dr. Junji Kawasaki



Dr. Kimiaki Nagamatsu was presented the experimental research for artificial reef in circulate flume tank. His research topic was focus on the effect of artificial reef design to water current. The objective of research was aim to understand how artificial reef can make up-welling (current turbulences). Up-welling can make sea water around artificial reefs to rich of nutrients. Various designs of artificial reefs were used for this experiment. Video recorder and camera also were used to record of the results.

3. Marine Civil Engineering Co., Ltd

Instructor: Mr. Osamu Taniuchi, Mr. Hiroshi Kimiya

Mr. Osamu Taniuchi introduced about Japan Artificial Fish Reef Association. JAFRA is the private association organized by 9 companies. They are exchange information to each other to promote artificial reef that can make a good fisheries. The materials used are high quality like concrete or steel or combination between concrete and steel. They developed artificial reef in various types of blocks it depends on type of target species based on the objectives of the project. They used Remotely Operated Vehicles (ROVs) to monitor and evaluate artificial reef. The evaluation method were used

by calculated to the total number of fishes in artificial reef. First step was counted the number of fish that appeared in the capture area of ROV camera. Then second step was calculated the total number of fishes in a big schools appeared in echo-sounder, which equipped on the research vessel, by the first step result. This method was need to understand the behavior and schooling performance of those fish species in artificial reef .

Conclusions

This study trip is very nice and useful for me to learned more on fisheries resource management from various sectors in Japan such as; professor from university, central government, researchers, private company, fisherman, prefectural government and artificial reef company. There are form different sectors but there had the same aim that make fishery resource sustained, healthy environment with happiness of fishermen and fishery product consumers. They had shown me good cooperatives between concern sectors that came out with a good data collection and resource management system in Japan that should apply the same system to Southeast Asia Region. Finally, I got a very good key point that only government or one sector cannot get a goal of sustainable fisheries resource management. Sustainable fisheries resource management will success by cooperation and strongly participation among stakeholder encouraging by good support from government and good data from scientists.

Acknowledgement

I would like to pass my gratitude to SEAFDEC's Secretary General, Dr. Chumnarn Pongsri, that gave me a great opportunity to enhanced my knowledge through this training visit program in Japan. I also would like to thank SEAFDEC's Deputy secretary general, Mr.Hajime Kawamura, Mr. Tsuyoshi Iwata and Mr. Akira Bamba for a very perfectly cooperated with Japan side for difficult arrangement of my training course. Lastly I express my warm thanks to Marino-forum 21 staffs; Mr. Ron Ishitani, Mr. Kenichi Kikutani, Dr. Kosuke Sano and also all supporting staffs for perfectly arranged all facilities, schedule, and transportation.

Household Livelihood Survey of Coastal Fishing Communities in Thailand

Rattana Tiaye, Sumitra Ruangsivakul, Jariya Sornkliang, Thanyalak Suasi
Training Department, Southeast Asian Fisheries Development Center (SEAFDEC)
rattana@seafdec.org

Introduction

The Research Institute for Humanity and Nature (RIHN) start a cooperative research project named "Coastal capability enhancement in Southeast Asia (CA)" in corporation with the SEAFDEC, EMDEC, Kasetsart University, and other related institutions/organizations. The CA Project composes of 6 components to study and develop the concept on "Area Capability" that can show how the ecosystem health can be harmonized with the welfare of the people who are directly and indirectly depend on the coastal fisheries resources. The household livelihood survey in coastal area is one part of the CA Project. This survey was therefore conducted in order to collect the baseline information of the fishing communities as well as to identify the status and structure of household livelihood in coastal area of Thailand. The sites of the survey are Rayong, Prachuap Khiri Khan and Chumphon Provinces. The household survey started from 2013 until 2014 by using the questionnaire that was developed and agreed by Socio-economic Section of SEAFDEC and RIHN. In 2015, social team is going to analyze the fishing household datasets.

Objectives;

1. To collect data and information for understanding the household livelihood of coastal fishing communities aspects; and
2. To identify the structures/aspects of fishers' household livelihood in coastal area of Thailand.

Methodology

1. Develop a questionnaire;
2. Define the sample size;
3. Collect the data by using questionnaire in Rayong, Prachuap Khiri Khan and Chumphon Province;
4. Analyze the data collected by using Excel and R Program; and
5. Publication: academic paper, book or manual of data collection and evaluation.

Result

During 2013 - 2014, social team started to collect data and information in Rayong, Prachuap Khiri Khan and Chumphon Province by using the secondary data and questionnaire including fishing, aquaculture, agriculture, marketing, social capital, fisheries management, religion, general public view of life and general information by focusing on fishing groups, as well as the middlemen also were interviewed to find out the marine product distributions.

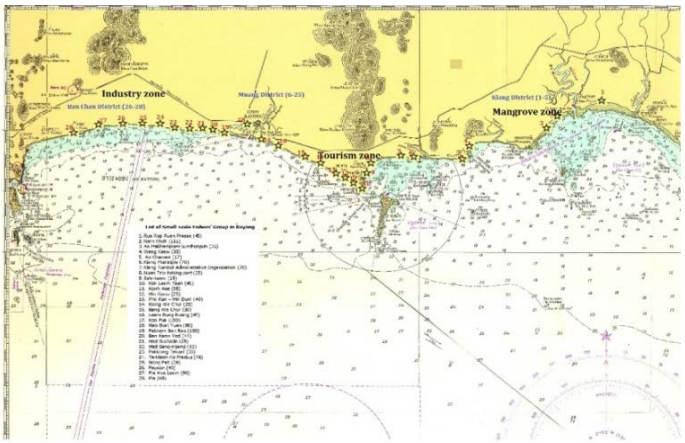


Fig. 1 *Location of small-scale fishers group at Rayong Province*

In Rayong Province, social team finished data collection with 297 samples in 28 coastal fishers' group (1,458 of total small-scale fishermen). There were three zones of coastal area based on area utilization namely; **industry zone**, **tourism zone** and **natural zone (mangrove area)**, as shown at *Fig. 1*.

For the marine products caught by fishers, it is supplied to not only the local market for a tourist and the local people but also urban market. It means the product is supplied for variety demands of local and national consumers (such as Chiang Mai Japanese Restaurant).

In Southern part of Thailand, The survey conducted at Prachuap Khiri Khan and Chumphon Province (*Fig. 2*), we plan to collect 274 samples of 14 fisheries communities, base on the number of small-scale fishing gear which registration with Fisheries Provincial. 222 samples have collected and remaining 55 samples which we try to finished in December 2014.

In 2015, Social team will be data analysis by using Excel and R Program, and draft the report, book or manual of data collection and evaluation for publication.

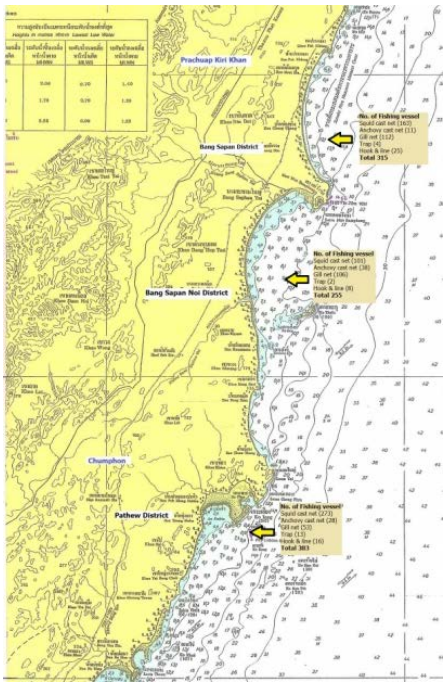


Fig. 2 *Location of small-scale fishers, Number of small-scale fishing gear at 1)Pathew District, Chumphon Province, 2)Bang Sapan, and 3)Bang Sapan Noi Districts, Prachuap Khiri Khan Province*

Conclusion

The household survey is fundamental information that can provide the suitable way for understanding the structures or aspects of the fishers' household livelihood who live along the coastal area. The outcome from this survey will be combined with other 5 components of Coastal capability enhancement in Southeast Asia Project to develop the "Area Capability Model" for harmonizing the biodiversity and productivity to achieve constructive linkage between local communities and ecosystems in coastal area of Thailand. Moreover, the data is also used full for the project planning and implementation in the future.

References

SEAFDEC-Secretariat, 2004, *Handbook on Collecting Fishery Statistics for Inland and Coastal Fisheries*. 165 p.

Halls, et al. 2005, *Guidelines for designing data collection and sharing systems for co-managed fisheries; part 1.* Food and Agriculture Organization of the United Nations, Rome, 18 p.

Halls, et al. 2005, *Guidelines for designing data collection and sharing systems for co-managed fisheries; part 2.* Food and Agriculture Organization of the United Nations, Rome, 62 p.

Promotion on earthworm culture as other alternative livelihood for small-scale fishers

Krit Phusirimongkol

Introduction

With due to insufficient income of small scale fishers who depend their earning on the fishing activities. In many cases that, those fishers be encouraged to increase income from the responsible fisheries while the fishery resources still need some period to recover, which is take time. So instead of just let fishers suffer from the in sufficient income we can look and promote others alternative livelihood even if some of them might not directly relates to the exactly fishing activity.

Ideally, the promotion of earthworms' culture can be other alternative livelihood for fisherman to increase their income. Earthworm culture is simple, low cost investment and can get good profit from each crop. Nowadays, many fishery sectors looking for earthworm: in case of hook and line fishing, earthworm can be used as bait. Especially case of ornamental fish aquaculture, earthworm is used for feeding; this is because earthworm is rich of protein and stimulant the bright color of the ornamental fish. Earthward can be culture in form of household's business.

As some of students from Tinsulanonda Fisheries College who are trained at TD during 7 October 2014 to 20 February 2015 are from fisheries family, some of their parents depend their life only on the fishing activity as mentioned above, so that the idea in promotion of earthworm culture is applied to this student group as trial campaign. With intention to equip this kind of alternative livelihood to them and this idea will be much more useful if the students can transfer the knowledge and skill of earthward culture to their family which object to increase their family's income and improve their well being in afterward.

Methodology

Promotion on earthworm culture as alternative livelihood

Promotion on earthworm culture as alternative livelihood for 10 students from Tinsulanonda Fisheries College on 22 November 2014

Result

On proceeding

FIRST STAGE REPORT OF SEAFDEC-FAO ENERGY AUDITS

T. Suthipong, T. Thaweesak, **M. Khunthawat**
Southeast Asian Fisheries Development Center, Training Department,
Suksawasdi Rd., Rhamphapa Sub-district, Prasamut Chedi District, Samutprakarn, 10290

Abstract

All Thai commercial trawlers depend on diesel oil. To indentify techniques of saving fuel and reducing expense the first project on energy audit was developed under cooperative working among Food and Agriculture Organization for funding supporter and South East Asian Fisheries Development Centre/ Training Department for auditing operator. The audit process exposed to find conditional values concerning fuel consumption of trawl fishing vessels. Fuel consumption profiles of six trawlers were created for estimating their consumption rate at various engine revolutions. A method is to save fuel by reducing ship speed two knots contributing to decrease fuel consumption rate at 50 % of W. Yingcharoen and 52.3 % of Choknimitr. In addition to consideration of fuel consumption rate, earning per fuel consumption is also important parameter. The audit results reported that W. Yingcharoen trawler consumes the highest total fuel consumption but it has the better revenue per fuel consumption, 72.5 THB/litter. The ship fuel consumption results from energy audit project provide for fishers to understand for monitoring trawler at optimum level during fishing operation contributing to decrease fuel cost.

Keywords: Energy audits on trawler, Auditing Thai Trawler

Introduction

Recently, tendency of fuel price impacting Thai fishery sector is declined due to world crude price under high competition pressure among producer organization in united state and Middle-East. However, with fluctuation of energy price and uncertainty of competition of several world crude oil producers, trend of fuel cost will be increased as an important factor again in the near future because of propulsion engine of fishing vessels almost relied on diesel oil. Nevertheless, marine resources in several fishing grounds are limited and sometime to be conserved in a period of conservative season so that it is both direct and indirect heavily impact and create negatively competition among fishery stakeholders. Various works attempted to seek several ways to improve efficient use of fuel with reducing water resistance occurred on both hull and fishing gears by remodelling, or maintaining good condition of engine, cleaning hull surface, or even reducing ship speed which is a simple method to be suggested, and etc.

To alleviate the situation, an energy audit methodology for fishing vessels has been developed, with three objectives: a) to develop efficient fuel use based on Australian energy audit process, b) to undertake a pilot energy audit for selected Thai trawlers, c) to disseminate results on benefits from energy audit to local fishers to estimate fleet wide costs and earnings, including the payback times, and provide recommendations for future work

Methodology

Energy auditing process of six small trawlers consisting of four vessels in Chonburi province in the Gulf of Thailand and the other two boats in Satun province in the Andaman Sea. Several monitoring equipments were installed on these trawlers to measure fuel consumption, engine revolution speed, ship position, ship speed, water current, and wind speed and direction. Measurement period will start at fishing port until the trawler arrived at the landing fishing port for unloading catches. Values on these indicator screens were recorded at real-time by CCTV camera whole operating periods. There are three fuel consumption periods in these data recording activities as starting, trawling, and stopping

period. Starting period is a period that engine was started until otter board launched into water. While trawling period is a period since otter board launched until hauled back onboard. And the last stopping period is a period of otter board onboard until turn off the engine. Not only the previous parameters were recorded, but quantity of catches and revenue from selling these catches were also recorded into the log sheet for estimating economic performance of each trawler.

Results and Discussions

At free trial measurement, these collected data were calculated and plotted into two relationships among engine revolution via fuel consumption and ship speed against engine revolution displayed in **figure 1** a) and b).

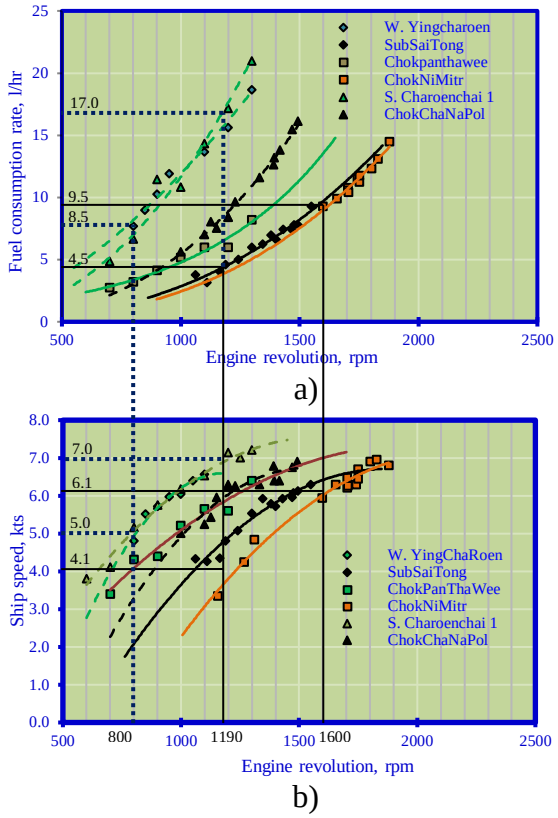


Figure 1 graph presents relationships of a) fuel consumption via engine revolution, and b) ship speed via engine revolution

Six characteristic profiles in figure 1 indicate that each trawler has individual feature line. W. The top lines of Yingcharoen and S. Charoenchai 1 mean that these boats consume the most fuel consumption while Subsaitong and Choknimitr the lowest. Referring some previous work advices to improve fuel efficient use by reducing ship speed one or two knots during steaming, thus two average trend lines of both W. Yingcharoen/S. Charoenchai 1 and Subsaitong/Choknimitr are set up. Assuming that these trawlers decrease ship speed down two knots, that are 7.0 to 5.0 knots of W. Yingcharoen/S. Charoenchai 1 and 6.1 to 4.1 knots of Subsaitong/Choknimitr. Values of fuel consumption will be drop from 17.0 to 8.5 l/hr of W. Yingcharoen/S. Charoenchai 1 and 9.5 to 4.5 l/hr of Subsaitong/Choknimitr. Two calculated percentages of saving fuel are 50.0 of W. Yingcharoen/S. Charoenchai 1 and 52.63 of Subsaitong/Choknimitr.

Exactly, decreasing ship speed of trawlers contributes to reduce fuel consumption but sailing time increased. Skippers have to consider a suitable way to be applied this idea without negative impact to their catch or time. Not only fuel consumption during free trial is evaluated, but fuel consumption all of trips have to be considered and shown in figure 2.
Nevertheless consideration on fishing performance must cover not only energy efficient use but also revenue received from selling catches. A ratio of revenue over unit fuel consumption should be an effective comparison value which shows in table 1. When looking at total fuel consumption, W. Yingcharoen consumes the highest value of 1,862 litter but Choknimitr as 656 litter, which W. Yingcharoen spent more expenditure than Choknimitr. Eventhough W. Yingcharoen paid fuel cost more than Choknimitr but W. Yingcharoen earn the highest revenue per fuel consumption as 72.5 THB/litter whereas the value of Choknimitr as 34.9 THB/litter. With revenue per fuel consumption ratio, earning performance of W. Yingcharoen is better than Choknimitr about two times.

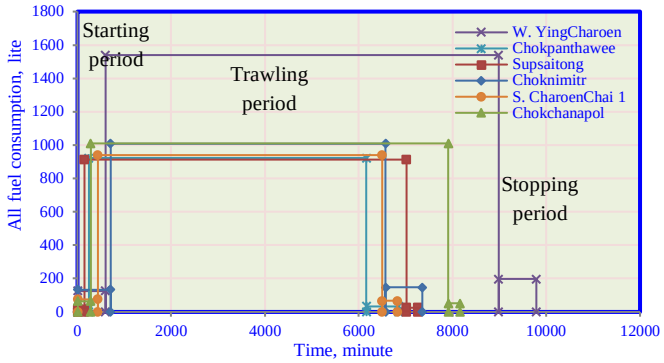


Figure 2 All fuel consumptions in all phases consisting of starting, trawling, and stopping period

Fuel consumption figure of all trawlers are the same. These trawlers consume a lot of fuel during trawling period due to high resistance drag force produced by trawl net/gear. To decrease this resistance force, there are several methods to be done as by remodelling net, or enlarging mesh size of net, or cleaning net after finishing the trips, imrove otter board efficiency, or etc.

Table 1 Economic effort of six investigated trawlers

Name of trawler		Wor YingChaRoen	ChokPanThaWee	SubSaiTong	ChokNiMitr	Sor ChaRoenChai 1	ChokChaNaPol
Duration	minutes	8,381.0	7,094.0	7,256.0	7,356.0	8,159.0	6,820.0
	hours	140.0	118.0	121.0	123.0	136.0	114.0
Total Fuel Consumption	l	1,862.2	978.2	956.3	1,288.8	1,124.7	1,149.4
Total catch	kg	3,249.2	1,179.3	1,190.0	855.0	1,316.0	1,432.1
Fuel consumption per hour	l/hr	13.3	8.3	7.9	10.5	8.3	10.1
Fuel consumption per catch	l/kg	0.6	0.8	0.8	1.5	0.9	0.8
Catch/fuel consumption	kg/l	1.7	1.2	1.2	0.7	1.2	1.2
Revenue	THB	134,961.0	46,589.0	53,797.0	45,000.0	33,002.0	46,000.0
Revenue per fuel consumption	THB/l	72.5	47.6	47.7	34.9	47.7	40.0
Revenue per hour	THB/hr	966.2	394.0	377.2	367.0	394.8	404.7

Therefore specifying efficiency of fishing vessel based on engineering or economic term is complicate comparison because of several variations of ship capacity, displacement, or even plenty of marine resources in each fishing ground, etc. The audit results only describe to amount of fuel consumption rate of each trawler along fuel consumption profile displayed in the previous charts. And also improving efficiency of hull or fishing gear enable to decrease energy used which relate to slightly diminish slope of fuel consumption profile.

Conclusions

Energy audit project proves that it is an important activity in estimating energy efficient use on fishing vessels. Measurement results of fuel consumption characteristic and ship speed enable to make understanding to fishers on fuel consumption rate of their boats to maximize ship performance through the fuel consumption profile chart. One advice technique by reducing ship speed for saving fuel, trawler of W. Yincharoen/S. Charoenchai 1 can drop fuel consumption rate to 50 % while Subsaitong/Choknimitr down to 52.63 %. This study separates three trawling operation periods consisting of starting, trawling, and stopping. Almost diesel oil was burst whilst trawling because of high drag resistance force on surface of trawl net/gear. But hull resistance and engine performance are main factor effecting high fuel consumption during starting and stopping period. In addition to consideration of total fuel consumption of trawlers, earning performance of fishing vessel is an important parameter by using ratio of revenue per fuel consumption. Two values of revenue per fuel consumption of W. Yingcharoen and Choknimitr are 72.5 and 34.9 THB/litter, respectively. W. Yingcharoen generates the highest revenue per fuel consumption in opposite with Chonimitr the lowest earning performance. Although the first project received some auditing results, but it still have more trawlers to be collected their conditional data for more accurate analysis and other improvements which will be done in the second phase.